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AN UNREASONABLE RULE IN SURVEYING.

By Professor P. H. PHILBRICK, M. S., C. E., Lake Charles, Louisiana.

The Government requires Surveyors, on account of the more rapid convergence of the meridians north of a parallel of latitude than south, to locate "correction parallels" every 24 miles north and every 30 miles south of the principal base. Where is the parallel of latitude from which the convergency for 24 miles north is equal to the convergency for 30 miles south? Let $x=$ the co-latitude of the required parallel. The arcs of two parallels included between two meridians are as their radii which are as the sines of their co-latitudes. Also 24 miles $=20'.85=a$ (say) and 30 miles $=26'.07=b$ (say).

Hence, we have $\sin(x+b)-\sin x=\sin x-\sin(x-a)$. Expanding it, $\sin x\,(2-\cos a-\cos b)=\cos x\,(\sin b-\sin a)$.

Therefore, $\tan x=\dfrac{\sin b-\sin a}{2-\cos a-\cos b}=\dfrac{\sin b-\sin a}{\text{vers}\,a+\text{vers}\,b}=32.16949.$

Hence, $x=88^\circ\,13'\,10''$ and $90^\circ-x=$latitude$=1^\circ\,46'\,50''$. The rule is not reasonable. The convergency upon each side of all parallels where surveys are made is sensibly the same.

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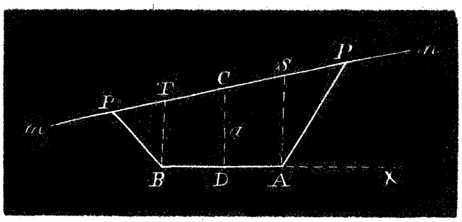
TO SET SLOPE STAKES WHEN THE SURFACE IS STEEP BUT SLOPES UNIFORMLY.

By J. M. BANDY, Professor of Mathematics, Elon College, North Carolina.

Let mn represent the surface of e ground. Let C represent the position of the centre peg, and let CD $(=a)$, the value of which is found from the level notes, represent the centre cut. The width of the road, BA, is b.

It is proposed to find what engineers designate as cuts at P, P', S, and T.



In the direction of P, and in connection with C, one setting of the rod determines the slope of the ground mn. Call this slope m. Now, since the co-ordinates of C are (o, a), D being the origin of co-ordinates, the equation of the surface, mn, is $y=mx+a$.....(1).

The quality of the soil determines the slopes of PA and $P'B$. Call this slope m'. Since the co-ordinates of A are $(\frac{b}{2}, o)$, the equation of PA is

$y=m'x-\dfrac{m'b}{2}$ .....(2).

Combining (1) and (2), the co-ordinates of P are known. Hence, the cut at this point is known. Designating the co-ordinates of P, just found, by (x'', y'') and the co-ordinates of C by $(x',y')[=(o, a)]$, $CP=\sqrt{(x''-x')^2+(y''-y')^2}$ ....(3).

Measure this distance, CP, and fix a stake at P.

The equation of SA is $x=\frac{b}{2}$ ....(4).

Substituting this value of x in (1), the cut at S is at once obtained. Denoting co-ordinates of S by (x'',y'') and co-ordinates of C by (x',y'), and substituting in (3), CS is known. Measure this distance, and fix a stake at S.

The same course of reasoning applies in finding the cuts at P' and T.

The writer has found this method more expeditious than *trial* and *error* when the surface was much inclined. The numerical computations did not require as much labor as maneuvering with the rod and level.

Since he has not seen the above method in any of the books which have fallen under his eyes, he has been induced to give it in the hope that it might prove useful, as well as suggestive, to others under similar circumstances.

NOTE ON MR. ELLWOOD'S REMARKS ON DIVISION.

By DAVID EUGENE SMITH, Ph. D., Professor of Mathematics in the Michigan State Normal School, Ypsilanti, Michigan.

Reluctantly, feeling that it is almost unnecessary, a note is offered on Mr. Ellwood's article on p. 47. Such articles float through the primary journals of education now and then, and possibly do no harm that can be undone by replying to them. But in a mathematical journal such pedagogy should not go unchallenged.

It is a trite idea that all advance in mathematics, and in all science generally, has had to contend with just such arguments as those of Mr. Ellwood. The whole history of the development of mathematics has been a history of the destruction of old definitions, old hobbies, old idols. When Ahmes copied the papyrus which now, after 3500 years, makes him famous, only one fraction could be written whose numerator was not one. A definition or an artificial symbolism created a barrier. For over a thousand years thereafter the Egyptians, Hebrews, Phœnicians, and Greeks recognized that barrier. But finally came an iconoclast and knocked down the sacred wall, and the Greeks learned about fractions.

The Arabs found negative roots to certain quadratic equations. Teachers raised their hands in horror. It was impossible; the sacred definition of number stood in the way. But by and by some one suggested that that definition better stand aside, and so the reality of negative numbers became recognized. Then came some other impossible roots, expressions that involved the square root of a